

# 非水相液體於土壤中滲流之研究

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## 摘要

本研究之主要目的在於以壓力儀、滲透儀試驗方法以及RETC\*程式預測滲透係數值，瞭解非水相液體於土壤中，在不同的張力狀況下其保持行為。試驗採用的土壤為渥太華砂及寶二水庫現地土樣；所採用非水相液體為：九五無鉛汽油、柴油及庚烷。

實驗結果顯示：進行壓力儀試驗時，試驗土壤的顆粒越小，有機液體的殘餘量會隨之增加。另外不同的有機液體，與空氣的界面張力越大則同一張力下有機液體的殘餘量也會變大。

進行滲透儀實驗時，在相同的體積含水比之下，與空氣界面張力越大則其滲透係數越小；另外試驗土壤的顆粒越小，相對的滲透係數也會跟著越小。

以 RETC 程式預測液體之滲透係數值，較為準確的為壓力儀及滲透儀保持曲線所得之結果。在同一個體積含水比之下，其所得之預測值多為實驗值之 0.3 至 3 倍，就大地工程上的應用來說，仍是可以接受的參考範圍。

\*附錄

# Permeability of Soils Partially Saturated by NAPL

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## Abstract

The main purpose of this study is to understand the hydraulic behavior between Non-Aqueous Phase Liquid (NAPL) and air in soils partially saturated by NAPL. Tempe cells were used to determine the Soil Water Characteristic Curve (SWCC) and custom-made fix-wall permeability cells were used to determine the hydraulic conductivity in soils. The RETC program is used to predict the hydraulic conductivity with empirical equations by utilizing SWCC data. The soils used in the study were Ottawa sand and Bow-Shan local sand. The NAPLs used were 95 gasoline, diesel, and heptane.

The results of Tempe cell tests showed that the larger the soil particles, the less the residual NAPL content. In addition, the liquids with higher surface tension seem to have better abilities to remain in the soils.

The results of permeability tests showed that the liquids with higher surface tension of air yield lower permeability at the given volumetric water contents. On the other hand, the smaller the soil particles, the lower the permeability.

The results also show that the hydraulic conductivity predicted utilizing SWCC data obtained during permeability and Tempe cell tests is more accurate. However, at any given volumetric water content, the hydraulic conductivity predicted by empirical equations is often 0.3 to 3 times of the experimental data. Therefore, the hydraulic conductivity predicted by empirical equations is acceptable when the results are

applied to engineering purposes.

